

QUARTERLY STATUS REPORT No. 6

Period 23 December 1965 - 22 March 1966

DESIGN, DEVELOPMENT, FABRICATION AND INSTALLATION OF  
105-INCH LUNAR AND PLANETARY TELESCOPE AT McDONALD OBSERVATORY

Contract NASr-242

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Project Director: Harlan J. Smith  
Director, McDonald Observatory

Department of Astronomy

Austin, Texas

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#### A. Outline of Progress Prior to this Reporting Period

The 105-inch design has been completed, a horizontal coude spectrograph specified, and the choice of optical material and contractor for the primary mirror made. The initial planning for the dome is complete, and preliminary architectural drawings have been accepted.

#### B. Progress during the Period 23 December 1965 - 22 March 1966

##### 1. Mechanical

Invitations to submit a Technical Proposal and Quotation for the necessary preparation of shop drawings, construction and erection of the telescope at McDonald Observatory were sent to American Optical (Fecker), Boller & Chivens, and Westinghouse Sunnyvale. (Because of their current work load, Warner & Swasey withdrew from consideration just prior to the time that final drawings and specifications became available.) All three companies invited to submit responded with interesting and complete proposals, but all three quotations were sharply over budget.

In the course of evaluating the three proposals, a meeting was held with each firm. It became evident during these meetings that there were several areas where the specification could be changed in the interest of lowering cost and still not degrade the astronomical quality of the telescope. Also, a considerable amount of misunderstanding of intent, misreading of drawings, and overestimating cost for contingency reasons was discovered. It was also clear that, for the present, significant cost reductions could be made by deferring certain of the more automatic parts of the telescope control system.

A revised specification was prepared considering the above factors, and the three firms were invited to resubmit proposals and quotations. The new quotations were significantly lower than the original, but all three were still over budget. The firm submitting the lowest quotation each time - Westinghouse - was the firm that demonstrated the best capability to fabricate the very large formed and welded

metal sections required for this telescope, and they also submitted the lowest quotation for the telescope control sub-system. In consultation with the NASA technical administrator, it was decided that it would be to the best interest of the project to negotiate with the low offerer, Westinghouse, a cost-plus-incentive-fee subcontract for constructing the telescope. This arrangement will allow Texas to work with the manufacturer to continue to reduce cost on items that will not affect the astronomical requirements of the telescope. At the end of the reporting period, a tentative agreement had been reached by all parties concerned, and a final draft of the proposed contract was in progress.

## 2. Optics

Three companies were invited to submit technical proposals and quotations for the optical finishing of the primary mirror and two secondaries. As outlined in the last report, the request for proposals specified a minimally acceptable figure with a provision for extended work toward a truly superb mirror insofar as time and money should allow. One firm, Davidson Optronics, submitted a proposal stating willingness to accept the highest specifications required in the request for proposals as the minimum. The reasons given for this confidence were their past experience in working with quartz and their recently developed improved testing techniques. Davidson reports that quartz, with its very low thermal expansion and good uniform polishing characteristics, offers the possibility of extremely fine figuring. This, coupled with a quick in-process measuring technique, offers possibilities of figure not previously considered attainable for such a large astronomical telescope primary. In line with this confidence, Davidson submitted the lowest quotation for the work. Accordingly, a fixed price contract has been awarded to Davidson Optronics for the primary mirror and two secondaries; Davidson has begun construction of the necessary large grinding machine and new building for such work.

Corning has completed the primary mirror blank and has delivered it to Davidson Optronics, the selected optical fabricator. Davidson has accepted the blank and agrees that it is of fine quality.

The f/18 secondary blank has been ordered from Corning with delivery to Davidson expected in June 1966. Two additional secondaries -- the f/9 and the f/33 -- are in process of being ordered from General Electric. The necessary flats and the two f/33 secondaries proposed as super reflecting coude secondaries remain to be ordered in the near future.

## 3. Coude

Important progress has been made in the design of the coude spectrograph. The concept phase has been completed during this reporting period. In consultation with Dr. Theodore Dunham, now

with the University of Tasmania, an arrangement has been found whereby the slit, collimators, grating, and cameras are all in one plane, and further all cameras are along the same optical center line to obtain maximum efficiency from the gratings. Most of the optical elements for the coude can be constructed from Pyrex instead of quartz, at considerably lower cost. Use of Pyrex is based on the fact that extremely close temperature control will be required for the coude room due to the long light path, and this low temperature excursion will give an ideal environment for the optical elements. However, the optical fabricator must be consulted to determine if using Pyrex with its higher temperature expansion coefficient will seriously increase the cost of figuring.

4. Although not financed by this contract, the rotating dome and necessary building to support it is a parallel project, integral to the schedule of telescope erection and installation of the coude spectrograph. The funding of the dome and building is now complete; and Charles W. Jones, in association with Rochlin and Baran Architects, has been chosen for the detail designs. The interrelations in schedule are shown by the chart attached at the end of this report.

#### C. Personnel Connected with the Contract

Specifically associated with the project during this reporting period at The University of Texas were:

Charles E. Jenkins - Administrative Supervisor  
Charles L. Seeger - Electronics and Control Engineering  
Marion L. Davis - Electronics and Control Engineering  
Maynard L. Wilson - Engineering and Instrument Design  
Charles D. Thompson - Engineering and Instrument Design  
John F. Blanton - Engineering and Instrument Design  
Jesse J. Sedwick - Engineering and Instrument Design  
Kelly A. Wightman - Drafting  
Howard G. Meyer - Reproduction  
Phyllis F. Kirkpatrick - Secretarial and Administration  
Ina B. Harrison - Secretarial

Various other members of The University of Texas Astronomy staff, though supported entirely or almost entirely under University budgets have taken a substantial interest and have spent considerable time on the telescope design work - among senior personnel, in addition to the Project Director, these were principally Drs. Neville J. Woolf, Andrew T. Young, Robert G. Tull, and Gerard de Vaucouleurs; and Research Engineer J. E. Floyd.

**D. Financial Report**

NASA Form 1030 (2-64) for this contract is submitted quarterly by the Auditor's Office of The University of Texas.

